

Audit

Report



OFFICE OF THE INSPECTOR GENERAL

**F/A-18 E/F PROGRAM AS A PART OF THE AUDIT OF THE
EFFECTIVENESS OF THE DEFENSE ACQUISITION BOARD
REVIEW PROCESS--FY 1992**

Report Number 92-097

June 5, 1992

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The following acronyms are used in this report.

ASD(PA&E)	Assistant Secretary of Defense (Program Analysis and Evaluation)
ASN(RD&A)	Assistant Secretary of the Navy (Research, Development and Acquisition)
COEA	Cost and Operational Effectiveness Analysis
DAB	Defense Acquisition Board
DIA	Defense Intelligence Agency
IPS	Integrated Program Summary
O&S	Operations and Support
RDT&E	Research, Development, Test, and Evaluation
STAR	Systems Threat Analysis Report
USD(A)	Under Secretary of Defense for Acquisition



INSPECTOR GENERAL
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June 5, 1992

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION
ASSISTANT SECRETARY OF THE NAVY (FINANCIAL
MANAGEMENT)

SUBJECT: Audit Report on the F/A-18 E/F Program as a Part of the
Audit of the Effectiveness of the Defense Acquisition
Board Review Process--FY 1992 (Report No. 92-097)

We are providing this final report for your information and use. Formal comments on a draft of this report were not received from the Under Secretary of Defense for Acquisition. However, comments were received from the Assistant Secretary of the Navy (Research, Development and Acquisition) and were considered in preparing the final report. DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Therefore, all addressees must provide final comments on the unresolved recommendation by August 5, 1992. See the "Status of Recommendation" section at the end of the finding for the recommendation you must comment on and the specific requirements for your comments. The recommendation is subject to resolution in accordance with DoD Directive 7650.3 in the event of nonconcurrence or failure to comment. We also ask that your comments indicate concurrence or nonconcurrence with the material internal control weakness highlighted in Part I.

We appreciate the courtesies extended to the audit staff. If you have any questions on this audit, please contact Mr. Russell A. Rau, Program Director, at (703) 693-0655 (DSN 223-0655) or Mr. Michael Welborn, Project Manager, at (703) 614-3459 (DSN 224-3459). The planned distribution of this report is listed in Appendix D.

Robert J. Lieberman

Robert J. Lieberman
Assistant Inspector General
for Auditing

Enclosure

cc: Secretary of the Navy

Office of the Inspector General

AUDIT REPORT NO. 92-097
(Project No. 1AE-0036.03)

June 5, 1992

F/A-18 E/F PROGRAM AS A PART OF THE AUDIT OF THE EFFECTIVENESS
OF THE DEFENSE ACQUISITION BOARD REVIEW PROCESS--FY 1992

EXECUTIVE SUMMARY

Introduction. In 1987, the Navy initiated a study of alternative variations of the F/A-18 to continue its strike-fighter role into the late 1990's and beyond. The F/A-18 E/F Program was designed to upgrade the F/A-18 C/D Night Attack aircraft with increased mission range, payload flexibility, and aircraft carrier operational suitability. As of February 28, 1992, the Navy planned to acquire 1,000 E/F aircraft for about \$5 billion in Research, Development, Test, and Evaluation funding, and about \$49 billion in procurement funding (FY 1990 dollars) through FY 2015. On May 6, 1992, a Defense Acquisition Board (DAB) Milestone IV/II Review was held, allowing the F/A-18 E/F Program to enter into Engineering and Manufacturing Development.

Objective. The overall audit objective was to evaluate the DAB review process for the acquisition of F/A-18 E/F aircraft. Specifically, we assessed the adequacy of the information the Military Departments and the Defense agencies provided to the DAB in support of the major milestone and program reviews and assessed compliance with DoD acquisition policy and compliance with the intent of congressional direction.

Audit Results. The Navy had not performed a Cost and Operational Effectiveness Analysis (COEA) supporting the Milestone IV/II review to enter the Engineering and Manufacturing Development phase of the acquisition cycle. Without a COEA, viable alternatives to this new development program may not be adequately assessed with regard to their relative cost and operational effectiveness. The lack of a COEA supporting the Engineering and Manufacturing Development decision is contrary to the intent of congressional direction on the F/A-18 E/F Program and DoD regulations.

Internal Controls. The audit identified a material internal control weakness in that controls were not implemented to ensure that the Under Secretary of Defense for Acquisition [USD(A)] made a Milestone IV/II decision based on a formal and up-to-date COEA, in addition to other Defense Acquisition Board required documents. The internal control weakness is further discussed in Part I of the report.

Potential Benefits of Audit. Potential monetary benefits are not readily quantifiable (Appendix B).

Summary of Recommendation. We recommended that a formal COEA of the F/A-18 E/F and alternative programs be prepared and program cost estimates and affordability assessments be updated.

Management Comments. The USD(A) did not formally respond to the draft report; however, the Assistant Secretary of the Navy (Research, Development and Acquisition) [ASN(RD&A)] responded but did not concur with our finding and recommendation. The complete text of ASN(RD&A)'s comments are in Part IV of the report. We request that USD(A) provide comments and that ASN(RD&A) reconsider his position and provide additional comments to the final report by August 5, 1992.

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The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, prepared this report. Copies of the report can be obtained from the Information Officer, Audit Planning and Technical Support Directorate, at (703) 614-6303 (DSN 224-6303).

PART I - INTRODUCTION

Background

In 1987, the Navy initiated a study of alternative variations of the F/A-18 to continue its strike-fighter role into the late 1990's and beyond. The F/A-18 E/F Program was designed to upgrade the F/A-18 C/D Night Attack aircraft with increased mission range, payload flexibility, and aircraft carrier operational suitability. The E version (like the A and C) will be a single seat aircraft, and the F version (like the B and D) will be a dual seat aircraft. As of February 28, 1992, the Navy planned to acquire 1,000 E/F aircraft for about \$5 billion in Research, Development, Test, and Evaluation (RDT&E) funding and about \$49 billion in procurement funding (FY 1990 dollars) through FY 2015. The total cost of the aircraft is unknown because of the planned incorporation of preplanned product improvements, which will be defined in the future.

The Navy plans to award sole source, cost-plus-incentive-fee/award fee contracts to McDonnell Aircraft Company and General Electric Aircraft Engine Company for the aircraft and engine, respectively. The aircraft engine is a derivative of the terminated Navy A-12 aircraft engine. The Navy plans to award the contracts in the fourth quarter of FY 1992 as the result of a May 6, 1992, Defense Acquisition Board (DAB) Milestone IV/II Review that approved the Program entering into the Engineering and Manufacturing Development phase of the acquisition cycle. In FY 1992, Congress appropriated \$250 million in RDT&E funds for the F/A-18 E/F Program. The Navy projected additional RDT&E funding of \$4.4 billion for FYs 1993 through 1997 and \$224 million for FYs 1998 through 2001 to develop the airframe and engine. OSD added \$130 million to the projected Navy F/A-18 E/F RDT&E funding for FYs 1992 through 1997 in the President's Budget for FY 1993.

The Navy plans to use the F/A-18 E/F aircraft in the fleet air defense and light attack mission areas, while relying on a new aircraft designated as the AX Program for medium attack capability currently provided by A-6 aircraft.

Objective

The overall audit objective was to evaluate the DAB review process for the acquisition of F/A-18 E/F aircraft. Specifically, we assessed the adequacy of the information the Military Departments and the Defense agencies provided to the DAB in support of the Milestone IV/II Review of the F/A-18 E/F Program and assessed compliance with DoD acquisition policy. In addition, we evaluated the F/A-18 E/F Program's compliance with the intent of congressional direction provided in Senate Report No. 102-154, on the Department of Defense Appropriation Bill, 1992, September 20, 1991. We also reviewed applicable internal controls.

Scope

We performed this program audit in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD, and accordingly included such tests of internal controls as were deemed necessary. We performed the audit from December 2, 1991, through May 21, 1992, and reviewed Trade Studies, DAB-required documents, and other data dated from June 15, 1988, to May 12, 1992. We discussed issues related to the DAB review with OSD, Defense Intelligence Agency (DIA), and Navy personnel responsible for the preparation and/or review of DAB-required documents. A list of activities visited or contacted is in Appendix C.

Internal Controls

The audit identified a material internal control weakness as defined by Public Law 97-255, Office of Management and Budget Circular A-123, and DoD Directive 5010.38. The audit concluded that existing internal controls, if properly implemented, were adequate to prevent or detect the deficiency identified in this report. However, controls were not implemented to ensure that the Under Secretary of Defense for Acquisition [USD(A)] made a Milestone IV/II decision based on a formal and up-to-date Cost and Operational Effectiveness Analysis (COEA), in addition to other DAB-required documents. Further, the Navy did not comply with DoD policies and procedures for preparing a COEA. Implementation of the recommendation will correct this weakness.

Copies of the final report will be provided to the senior officials responsible for internal controls within OSD and the Department of the Navy.

Prior Audits and Other Reviews

There has been no prior audit coverage on the F/A-18 E/F aircraft relating to the DAB review process.

Other Matters of Interest

The Navy's January 8, 1992, F/A-18 Integrated Program Summary (IPS) stated that a formal COEA was not needed for the F/A 18 E/F Program. The Navy made this statement even though OSD had not decided whether to waive the requirement for a COEA. In addition, this statement directly conflicts with congressional direction. The Senate Appropriations Committee, as part of Report No. 102-154, questioned the need for the F/A-18 E/F Program based on its cost and utility. Specifically, the Committee considered it "prudent to moderate the proposed pace of the F/A-18 E/F Program to prevent premature commitment to a costly program which may not be necessary, and which may not deliver as advertised." The Committee directed OSD to provide the following information by April 15, 1992.

An updated cost estimate for the program, including a full listing of all the upgrades contemplated for the F/A-18 E/F, the total cost, and costs between fiscal years 1992 and 1998 to develop, procure, and install each upgrade, the timetable for such acquisition and installation, and whether each upgrade project is fully funded in these years.

An updated projection by the U.S. intelligence community validating in detail, by region, scenario, and potential adversary, the most likely and realistic air-to-air and surface-to-air threats the F/A-18 E/F would face in the years 1998-2010, and the specific validated threat capabilities which each particular F/A-18 E/F upgrade project is intended to counter.

An independent assessment of the capabilities of each F/A-18 E/F upgrade to counter each specific threat.

A new cost and operational effectiveness analysis by an independent organization in no way connected with the Navy, assessing the cost and operational effectiveness of the E/F with the F/A-18 C/D's configured as they are programmed to be by fiscal year 1996, and with the emerging designs for the AX.

An independent assessment by the Air Force's civilian and military experts of the proposed survivability features of the E/F and their likely effectiveness against the expected threats and their resistance to countermeasures.

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PART II - FINDING AND RECOMMENDATION

COST AND OPERATIONAL EFFECTIVENESS ANALYSIS

The Navy had not performed a COEA for the F/A-18 E/F and alternative programs in support of entry into Engineering and Manufacturing Development, as required by DoD regulations and congressional guidance. The Navy requested that the COEA requirement be waived because of the need to proceed promptly with the F/A-18 E/F Program and the extensive industry trade studies performed on the F/A-18 E/F aircraft. The Navy concluded that the F/A-18 is the best alternative for enhancing the fleet air capabilities until a follow-on program is fielded. Without a COEA, viable alternatives to this new development program, including the Navy AX program, may not be adequately assessed with regard to their relative cost and operational effectiveness before the F/A-18 E/F Program is developed.

DISCUSSION OF DETAILS

Background

A COEA evaluates the costs and benefits of alternative courses of action to meet recognized Defense needs and determines the total life-cycle costs and operational effectiveness of alternative programs and the associated program for acquiring each alternative. DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," part 4, section E, February 23, 1991, discusses the policies and procedures for developing COEAs to support milestone decision reviews.

Policies. DoD Instruction 5000.2 states that COEAs are intended to aid decisionmaking, facilitate communications, and document acquisition decisions by highlighting the advantages and disadvantages of the alternatives being considered. The COEAs also show the sensitivity of each alternative to possible changes in key assumptions (such as threat) or changes in variables, including selected performance capabilities. Further, a COEA provides early identification and discussion of reasonable alternatives among decisionmakers and all staff levels. Disagreements on key assumptions and variables must be explicitly identified. Additionally, a COEA must have thresholds that are the maximum cost or the minimum acceptable performance that can be tolerated in a program before other alternatives become more cost-effective.

Procedures. A COEA includes an analysis of the mission needs, threat, U.S. capabilities, interrelationships of systems, contribution of multirole systems, measures of effectiveness, costs of alternatives, and cost-effectiveness comparisons. The DoD Component Head responsible for the mission area in which a deficiency or opportunity is identified determines the independent analysis activity that will prepare the COEA. The

Joint Staff should ensure that the full range of alternatives is considered, organizational and operational plans are developed, and joint Service issues are addressed.

The Assistant Secretary of Defense (Program Analysis and Evaluation) [ASD(PA&E)] assesses the adequacy of COEAs submitted in support of DAB reviews. The ASD(PA&E) will provide, as necessary, guidance tailored to the program under review to be included in the DAB review procedures memorandum from USD(A). In the DAB process, the COEA is required at Milestone I, Concept Demonstration Approval; Milestone II, Development Approval; Milestone III, Production Approval; and Milestone IV, Major Modification Approval. At Milestone IV, the analysis is an update to the previous analysis, if it is available. The elements of the updated analysis for the Milestone IV review will be specified by the milestone decision authority as part of the premilestone planning process.

Performance of a Cost and Operational Effectiveness Analysis

At the July 11, 1991, DAB planning meeting for the F/A-18 E/F, 10 Milestone II documents, 1 of which was a COEA, were requested to form the basis for a Milestone IV decision. In an August 30, 1991, memorandum, the Assistant Secretary of the Navy (Research, Development and Acquisition) [ASN(RD&A)] requested that the COEA be waived because a COEA was not required for a Milestone IV review and because the Secretary of Defense had already committed to the development and procurement of the F/A-18 E/F aircraft. This memorandum also recommended limiting the scope of the COEA to cost-effectiveness comparisons of the F/A-18 E/F aircraft to the F/A-18 C/D aircraft in Navy and Marine Corps roles. On September 27, 1991, the Chairman of the Conventional Systems Committee responded to the Navy, stating that a formal COEA might not be required. This response was made after the September 20, 1991, Senate report, which directed that a COEA be performed. The Chairman requested that the Navy submit to OSD the Trade Studies that had been done to justify the proposed modification. The ASD(PA&E) personnel reviewed the Trade Studies and, in a memorandum dated October 22, 1991, requested additional information concerning the cost and operational effectiveness of the F/A-18 E/F. The Navy responded to the request for additional information in several briefings that concluded on February 6, 1992.

The Navy's proposed substitution of the Trade Studies for the COEA will not adequately examine the cost and operational effectiveness issues of the proposed F/A-18 E/F Program. Specifically, the Trade Studies do not adequately cover threat, alternatives, cost, and relation to baseline cost estimates.

Threat. DoD 5000.2-M, part 8, section 2.b(2), states that a threat analysis determines those elements against which a given system might be used and the forces that could be used against the system. The threat should be analyzed to identify the

condition that might exist when the new system is employed. Although the Trade Studies are not threat assessments, the threat that the system will face forms the basis for the proposed operational specifications in the Studies. The Trade Studies proposed by the Navy as a substitute for the COEA were developed between September 1987 and June 1988 by the Naval Air Systems Command, McDonnell Douglas Corporation, and the Center for Naval Analysis. The basis for the F/A-18 E/F Trade Studies was the Soviet Union at the height of the Cold War; however, the Trade Studies do not reflect the current world situation. For example, the Studies do not consider the impact of the disestablishment of the Soviet Union or the potential reductions of aircraft carrier battle groups. The DIA rejected the initial F/A-18 E/F System Threat Assessment Report (STAR) in October 1991 because the discussion of Soviet military organization, operation, and procurement did not reflect recent events. Subsequently, DIA made approximately 165 substantive changes to the STAR, reflecting the current world situation. Such changes may have a significant impact on the F/A-18 E/F operational requirements that have not been covered in the Trade Studies.

Alternatives. DoD 5000.2-M, part 8, paragraph 12, states that the scope of a COEA depends upon the acquisition stage to which the system has advanced, the milestone decision to be made, and the system's dollar value. For example, a Milestone II decision includes total life-cycle costs expressed in both constant and current dollars. Additionally, life-cycle estimates can provide for all alternative design approaches. A Milestone IV decision should consider the costs and consequences of all alternatives including the current program. In either a Milestone II or a Milestone IV decision, alternatives must be examined in the COEA; however, from the beginning of the DAB process, all alternatives were not considered.

At the COEA meeting convened by the ASD(PA&E) on July 16, 1991, the ASD(PA&E) principal stated that there would be no side by side comparison of the F/A 18-E/F, F-14D, and AX. He also said that there was no readily competitive alternatives to an F/A-18 upgrade other than a new start or a foreign carrier aircraft. This statement conflicts with DoD 5000.2-M, part 8, which states that even for a Milestone IV decision, the COEA should consider the costs and consequences of all alternatives, including maintaining the current program. Additionally, such initial decisions adversely affect the objectivity of the DAB process and may lead to inappropriate decisions. On August 30, 1991, the ASN(RD&A) requested a waiver from the requirement to provide a COEA for the F/A-18 E/F Program. The ASN(RD&A)'s rationale was that the F/A-18 E/F is an upgrade of an existing aircraft and that the Secretary of Defense had already committed to developing and procuring this aircraft. It is true that the F/A-18 E/F is an upgrade of the F/A-18 C/D model; however, the F/A-18 E/F will not be a modification of existing aircraft but rather new

production. Additionally, the changes are significant and comprehensive. Significant changes to the F/A-18 E/F airframe are listed below.

- o The fuselage was increased by 4 feet and the wing area by 25 percent. These changes will enable the F/A-18 E to carry at least 3,600 pounds of additional internal fuel over the current F/A-18 C model in the strike-fighter role.

- o The fuselage structure, landing gear, and other structural and mechanical components will be modified to accommodate the increased gross weight. These modifications will also enable preplanned product improvement growth into the next century.

- o Two additional wing weapon stations will be added.

- o Flight control computers will be modified to incorporate new flight control laws and engine control functions.

The F/A-18 E/F will also have a new engine, which is a derivative of the current F/A-18 aircraft engine. Although the core of the new engine was partially developed under the Navy's A-12 Program, the new engine will still undergo a complete development and test program during the Engineering and Manufacturing phase of the F/A-18 E/F Program. Such significant changes essentially make the F/A-18 E/F a new aircraft. Although the Secretary of Defense may be committed to the development and procurement of the aircraft, it is the responsibility of the DAB process to validate the need for, and cost-effectiveness of, the Program.

Further, the ASN(RD&A), in his August 30, 1991, memorandum to the ASD(PA&E), made the following observations if the decision was made to require a COEA.

If, however, we are going to do a F/A-18 E/F COEA and since there will be significant overlap in capability for many missions, it is essential that the AX COEA and analysis conducted in support of the F/A-18 E/F be consistent. Accordingly, additional alternatives such as the F-14D quickstrike and a Naval version of the Rafale should not be included in the F/A-18 E/F COEA. The F/A-18 E/F COEA should be limited only to cost effectiveness comparisons to the current baseline F/A-18 C/D in Navy and Marine Corps roles.

Limiting the COEA to the F/A-18 C/D baseline defeats the purpose of performing the COEA. The fact that many missions for the proposed AX and the F/A-18 E/F will overlap makes it essential that the AX and F/A-18 E/F be compared. Additionally, as reported in Senate Report No. 102-154, the Secretary of Defense stated that the AX is expected to possess a significant air-to-air and air-to-ground capability for offensive and defensive purposes. Based on the Secretary of Defense's statement and the designs expected to be proposed by some of the industry teams, the Senate Committee concluded that the AX could fulfill some of the air-to-air missions of the F/A-18 E/F.

In response to the September 27, 1991, memorandum from the Chairman of the Conventional Systems Committee, the Navy provided the requested Trade Studies. Our examination of the ASD(PA&E) request for additional information on the Trade Studies, dated October 22, 1991, indicated that there were 13 topics that the Trade Studies did not adequately address. Two of the thirteen topics dealt with alternatives. Specifically, the ASD(PA&E) wanted an examination of the French Rafale's potential to meet minimum requirements and a summary of "Carrier Airwing Study-2010" alternatives with an explanation for dropping the F-14D Quick Strike aircraft from further consideration.

Our examination of the Navy's presentation to the ASD(PA&E) revealed no mention of alternatives to the F/A-18 E/F. Specifically, the Navy did not consider the French Rafale or discuss the F-14D Quick Strike aircraft in its presentation.

Cost. A major factor in a COEA is the cost estimates for the program under consideration. By the Milestone II decision point, there is generally sufficient information to narrow cost estimate intervals to a point estimate to develop total life-cycle costs. Point estimates are bounded in the COEA by an uncertainty range derived by a cost uncertainty analysis. Additionally, the cost sensitivity of changes in certain parameters is determined through cost sensitivity analysis, which must be documented and reflected in the COEA.

Cost uncertainty analysis. DoD 5000.2-M, part 8, section 2.b(11)(d), states that cost uncertainty is inherent in cost estimates, particularly in the early stages of development, and requires that the estimates be prepared to offer a more realistic range of the true cost of a program using either statistical analysis or subjective expert opinion. Navy cost estimates failed to allow for potential unplanned system changes, technical problems, schedule shifts, and estimating errors. The core of the E/F Program is to provide the fuselage space and improved engine power to permit upgrades shortly after the basic configuration is fielded. The cost of developing and procuring these additional capabilities is not included in the estimates of \$5 billion in RDT&E funding and the \$49 billion in procurement funding. Therefore, the total cost of the E/F Program has not been presented by the Navy.

Cost sensitivity analysis. DoD 5000.2-M, part 8, section 2.b(11)(e), defines cost sensitivity as the degree to which changes in certain parameters cause changes in the system's cost. Each potential change should be tested independently, and each sensitivity analysis must be documented. The cost of preplanned improvements to the F/A-18 E/F after it is fielded have not been fully estimated. These improvements will be incorporated into the F/A-18 E/F as preplanned product improvements during the Production and Deployment phase. As of the time of the audit, these preplanned product improvements have not been defined, and the cost sensitivity impact will not be developed until some time in the future.

Congress is also questioning the cost sensitivity of the F/A-18 E/F aircraft as evidenced by the language in Senate Report No. 102-154, which states that the need for the E/F upgrade is hypothetical based on the Defense Secretary's projection and expected contract designs. Additionally, the report states that the more the AX is capable of air-to-air combat and supersonic speeds, the more F/A-18 C/Ds should be produced as an affordable alternative to the E/F.

Relation to baseline cost estimate. DoD 5000.2-M, part 8, section 2(11)(f), states that COEA costs must be based on a valid baseline cost estimate. The baseline cost estimate serves as the life-cycle cost estimate for the initial case in the analysis. If the baseline cost estimate is incomplete (or has not been validated) and time is a factor, the analysis may contain unvalidated estimates. However, this could result in last minute changes that would have to be accommodated later. The Navy has not estimated total life-cycle costs for the F/A-18 E/F Program, rather an incomplete estimate was provided in the IPS. Specifically, the Navy did not estimate total operations and support (O&S) cost requirements for the Program. The life-cycle cost presentation of O&S costs, estimated at \$7.7 billion, is curtailed in FY 2015, which is the last year a production contract is proposed to be awarded but not the last year of O&S costs for the Program. However, the Navy Baseline Independent Cost Estimate shows estimated O&S costs of \$30.7 billion through FY 2040. Therefore, the total life-cycle cost estimate of \$61.6 billion (FY 1990 dollars) is understated by \$23 billion (\$30.7 billion minus \$7.7 billion) in the IPS. Further, the Navy did not estimate O&S costs in then-year dollars in any of the DAB documents reviewed, thereby showing a lower projection for life-cycle costs. A footnote in the IPS stated that O&S costs were not in then-year dollars in order "To avoid miscalculation of O&S costs" The revised O&S cost estimates provided in the final IPS do not comply with DoD 5000.2-M, part 4, section C, which states that O&S funding should be identified through the end of the system life-cycle and in both constant and then-year dollars.

In the draft of this report, we indicated that the draft IPS showed a constant level of O&S costs at \$2.3 billion starting in FY 2011 although an additional 281 aircraft were planned for delivery in FYs 2011 through 2013. Also, O&S costs were not estimated beyond FY 2013, although an additional \$26.7 billion (FY 1990 constant dollars) was estimated to be required to operate and support the program through FY 2030. The final IPS provided to the DAB contained similar deficiencies with regard to total O&S costs as discussed above and annual O&S costs as discussed below. Specifically, O&S costs were not shown in FY 1999 for the delivery of 12 aircraft; however, the draft IPS showed about \$105.8 million (FY 1990 constant dollars) for the support of 12 aircraft delivered in FY 1999. The final IPS also showed that O&S costs remained fixed at about \$82.4 million (FY 1990 constant dollars) from FYs 2000 through 2003, which would indicate that annual costs stabilized at that amount based on a constant level of 12 operational aircraft with no additional deliveries. However, the IPS shows that an additional 108 aircraft will be delivered in FYs 2000 through 2003 with no increase in the associated military personnel and operations and maintenance costs. It is not reasonable to assume that O&S costs will remain fixed when the aircraft inventory increases by 108 aircraft above the initial 12 deliveries. We therefore consider the Navy's use of the \$61.6 billion (FY 1990 constant dollars) as the total life-cycle requirements to be understated because of the omission of O&S costs in FY 1999 and the potential understatement of O&S costs in FYs 2000 through 2003.

Another interrelated critical element of a COEA is the projected production rate. Generally, higher production rates result in lower total and per unit procurement costs because of such factors as production efficiency. The Navy proposes procurement of 12 aircraft per year starting in FY 1997 and ending in FY 2015 with peak production at 72 aircraft per year. Total production is 1,000 aircraft. These procurement quantities will require over \$3.5 billion annually (FY 1990 constant dollars). However, the affordability assessment provided in the draft IPS did not compare these funding requirements to topline Defense Planning Guidance and long-range modernization and investment plans, as required in DoD 5000.2-M, part 4, section G. The comparison focused on the F/A-18 Program relative to the F/A-18 E/F Program, which does not answer the question of whether the Program is affordable. The final IPS presented for the May 6, 1992, DAB Milestone IV/II Review showed that the F/A-18 E/F Program would result in the Navy exceeding fiscal constraints on total available funding, and the USD(A) included provisions in the Acquisition Decision Memorandum (Appendix A) for the Navy to demonstrate full funding of the Program in the Navy 94-99 Program Objective Memorandum prior to awarding the Engineering and Manufacturing Development contracts. Therefore, we consider the affordability of these production rates and the impact of

alternative production rates to be direct parts of the COEA and a matter that must be addressed by the Navy before the Engineering and Manufacturing Development contracts are awarded.

Cause for not performing a Cost and Operational Effectiveness Analysis

With the termination of the Navy A-12 and F-14D aircraft programs, the Navy has concluded that the F/A-18 is the best alternative for enhancing the fleet air capabilities until the fielding of follow-on programs. This conclusion has been reached without benefit of a COEA. However, a COEA performed by the using command is essential to assess alternative variations of the F/A-18 and the quantity of F/A-18 E/F aircraft required to fulfill mission requirements, in addition to alternative platforms and the baseline of existing fleet aircraft. Certain fundamental information concerning, for example, updated threat assessments and the number of aircraft carrier battle groups also directly affect the cost and operational effectiveness of various alternatives.

The Navy has concluded that a COEA is not required because the F/A-18 E/F is an upgrade of an existing program, rather than a new development program; and the Secretary of Defense had agreed to support the development and procurement of the F/A-18 E/F. A COEA focusing on the Navy attack mission areas that provides for a logical determination of the future composition of Naval airwings is considered essential before commencing either the F/A-18 E/F or AX Programs.

Effect of not performing a Cost and Operational Effectiveness Analysis

In our opinion, a COEA is required in support of the F/A-18 E/F Program entering Engineering and Manufacturing Development by Senate Report No. 102-154, DoD regulations, and sound program management. The objective of a COEA is focused on fulfilling mission needs, rather than supporting procurement of a particular systems platform. Therefore, performing a COEA of the composition of future carrier airwings before awarding major development contracts is an essential part of effective program management. We recognize that acquisition regulations provide the latitude to the milestone decision authority, in this capacity USD(A), to establish specific documentation requirements for each milestone or program review. However, we believe such authority should be used to provide the acquisition decisionmaker with the flexibility to execute programs when these unusual circumstances exist, rather than to bypass otherwise valid requirements for information and analyses necessary to make sound decisions. The F/A-18 E/F Program is a major new program start, entering Engineering and Manufacturing Development, and as such should be revised to comply with all of the associated rigors of the acquisition process. A complete assessment of alternatives has not been done, because no COEA has been prepared

and the Navy Trade Studies were not intended to provide the level, quality, or extent of information contained in a COEA. In addition, the Trade Studies are dated and lack, as a minimum, the appearance of independence due to the substantial contractor participation and exclusion of alternatives that are not based on the F/A-18 aircraft. Also, the Trade Studies are deficient in that they do not address the current threat or the ability of all alternatives to counter it. A COEA is required in support of the alternative selected, as well as to establish the thresholds for the program as it proceeds through Engineering and Manufacturing Development. Cost estimates and affordability assessments supporting the performance of a COEA should be reaccomplished so as to comply with DoD regulations concerning their preparation.

RECOMMENDATION FOR CORRECTIVE ACTION

We recommend that the Under Secretary of Defense for Acquisition require a formal Cost and Operational Effectiveness Analysis on the F/A-18 E/F and alternative programs, before entering into an Engineering and Manufacturing Development contract, and revise supporting cost estimates and affordability assessments to comply with DoD 5000.2-M, part 4.

MANAGEMENT COMMENTS

We did not receive written comments to the draft report from USD(A). The Deputy Inspector General met with the USD(A) to discuss the audit results on May 4, 1992, prior to the May 6, 1992, DAB Milestone IV/II Review. Based on additional information provided at that meeting and subsequent to the meeting, we performed additional audit work to assess management actions associated with our audit finding and recommendation. Specifically, we evaluated the updated DAB documentation generated after our draft report was issued and we assessed the Acquisition Decision Memorandum, dated May 12, 1992, (Appendix A) resulting from the May 6, 1992, DAB as it relates to our audit finding and recommendation. We received comments from the ASN(RD&A), who nonconcur with the recommendation and provided clarifying information and comments on the finding. Complete comments by the ASN(RD&A) are in Part IV of this report.

Regarding the recommendation, the ASN(RD&A) stated that the approach taken to fulfill COEA requirements was consistent with DoD Instruction 5000.2 for Milestone IV and OSD direction. Specifically, the ASN(RD&A) stated that all cost analyses required by DoD Instruction 5000.2 were furnished to OSD and that final cost estimate documentation was submitted on February 28, 1992. The ASN(RD&A) further noted that the report did not state that the program manager's estimate, the Navy Center for Cost Analysis' Independent Cost Estimate, and the OSD Cost Analysis Improvement Group's cost estimate are within 1 percent of each other. Finally, the ASN(RD&A) stated that the audit was conducted using draft documentation before the Navy responded to all OSD requests for information and before the acquisition

review process had been completed. Of particular importance was the Navy's updated affordability assessments and the May 4, 1992, memorandum by the ASN(RD&A) to USD(A) addressing the cost-effectiveness of various alternatives to the F/A-18 E/F Program.

AUDIT RESPONSE TO MANAGEMENT COMMENTS

Comments by the ASN(RD&A) are not considered responsive because:

- o The Navy's position is not based on a valid COEA, as defined in DoD Instruction 5000.2, part 4, section E, but based instead on a literal interpretation of one segment of DoD Instruction 5000.2, part 4, section E, while ignoring the full scope of the Instruction as it relates to the performance of a COEA. The Navy states that a COEA may be required for Milestone IV; however, the program was slated for a combined Milestone IV/II review. The Navy chose to omit the COEA requirements of Milestone II which are more stringent than those of Milestone IV even though OSD called for such documentation. The resulting delay in performance of a COEA during deliberations on the need for the analysis precluded its completion prior to the scheduled DAB review. The USD(A) memorandum of September 27, 1991, states that for the F/A-18 E/F Milestone IV/II DAB review, the Conventional Systems Committee will review all of the topics routinely considered in preparation for a Milestone IV review, including Milestone II documentation, in accordance with DoD Instruction 5000 series documents and the Committee's standard operating procedures.

Milestone II documentation requirements include a COEA that establishes performance floor and ceiling cost objectives or acceptable bands for possible combinations of cost and performance; specifies cost and performance thresholds beyond which the validity of the COEA conclusions must be reaffirmed; shows the tradeoffs used to arrive at the objectives for Phase II, Engineering and Manufacturing Development; and examines the impact of program termination. Additionally, DoD Instruction 5000.2, part 3, states that a Milestone IV review should carefully consider the availability of other alternatives to address the deficiency, which includes the option of entering Phase 0, Concept Exploration and Definition.

- o The Navy's decision to request a waiver rather than to fulfill COEA requirements was not reasonable given the dollar magnitude of the Program and the ongoing controversy over the future of Naval aviation. Milestone II COEA requirements are applicable at the stage at which milestone decision authorities must rigorously assess the cost and operational effectiveness as well as the affordability of an Engineering and Manufacturing Development program, and establish a Development Baseline, whereas Milestone IV is Modification Approval, where the intent is to ensure that all reasonable alternatives are examined prior to committing to a major modification or upgrade of a system that

is still being produced. Documentation requirements for Milestone IV decisions have more flexibility than for Milestone II decisions because upgrades or modifications do not necessarily result in new major Defense acquisition programs. However, if the Milestone IV does result in a new major Defense acquisition program, then the more complete documentation requirements are logical. The prudent approach would be to exercise the milestone with the more comprehensive requirements that would cover both milestones because Milestone II provides more information and also encompasses requirements of Milestone IV. The preceding rationale makes good business sense due to the considerable funding required to develop and procure the F/A-18 E/F, the mission it is to satisfy during its useful life, and the growing scarcity of Defense funding.

o Our report did not question whether the cost estimates were in agreement but, rather, the appropriateness of not performing a COEA on a program that is entering development and will cost \$4.9 billion and \$49.1 billion, in FY 1990 dollars, for development and procurement, respectively. Additionally, by the time the program reaches a Milestone III decision point where a COEA is clearly required, it will have expended substantially all development funding without the benefit of an assessment of cost and operational effectiveness, and 42 aircraft will be on contract. While the cost estimates are close, the presentation in the IPS is still incomplete and can be misleading. Specifically, O&S costs are curtailed in FY 2015; therefore, the total FY 1990 dollar life-cycle requirement is understated by approximately \$23 billion (FY 1990 dollars), which represents an additional 25 years of O&S costs through FY 2040. Also, O&S costs are not presented in then-year dollars; therefore, the total then-year dollar life-cycle requirement through FY 2015 is understated by an unspecified amount.

o We used the latest information provided by OSD at the time to arrive at the finding. Final documentation lowers the procurement quantity from 1,456 to 1,000, extends procurement through FY 2015, and increases per average unit cost by approximately \$5 million, but does not lessen the need for a COEA on the \$54 billion program. The conditions at the date of the draft report remain the same except for those noted above. The Navy concludes that the F/A-18 E/F is the best alternative but has summarily dismissed all viable alternatives, including the Navy AX, by contending that no other alternatives exist. Given the cost of the program and the importance of the mission, it would be prudent for the Navy to perform a COEA. A COEA would ensure that all alternatives have been addressed so that the public and Government perceive the Navy as prudently expending acquisition funds based on the most comprehensive information available based on DoD Instruction 5000.2 rather than lesser studies not complying with the Instruction. A COEA at this point in the Program is also beneficial in that it provides the milestone decision authority the information with which to make a

decision and approve or adjust the thresholds to be used to oversee program progress to the Milestone III Production and Development decision.

We request clarification of the USD(A) position in comments to the final audit report. In the F/A-18 E/F Acquisition Decision Memorandum, dated May 12, 1992, the USD(A) stated that he will review the letter contracts for Engineering and Manufacturing Development of the airframe and engines before their award. His approval decision for the letter contract award must be further supported by initial data in the comprehensive Navy AX COEA. This AX COEA will also address the F/A-18 C/D and F/A-18 E/F alternatives. The formal Navy AX COEA will be submitted for USD(A) review at least 30 days before definitization of the letter contracts. The USD(A)'s review of the Navy AX COEA prior to this approval of the Engineering and Manufacturing Development contracts may fulfill the intent of our recommendation concerning a COEA for the F/A-18 E/F, depending on the scope of the COEA performed. Specifically, if the AX COEA meets all the requirements established in the applicable acquisition instruction and manual, and establishes objectives, acceptable bands, and thresholds for the cost and performance of the F/A-18 E/F Program, then the intent of our recommendation in this area would be satisfied. However, the Acquisition Decision Memorandum goes on to state that a COEA is not required for a Milestone IV decision and sufficient information was available in the context of this decision to proceed with the Program. This point appears to contradict earlier statements in the decision memorandum concerning the review of the AX COEA. Additionally, we do not contend that the acquisition directives provide the flexibility to waive COEA requirements at a Milestone IV review, but clearly require a COEA at Milestone II that supports a decision to proceed through Engineering and Manufacturing Development to a Milestone III Production and Deployment decision.

We also consider the Acquisition Decision Memorandum to potentially be responsive to our audit finding concerning cost estimates and affordability assessments because USD(A) directed the Navy to submit a fully funded F/A-18 E/F Program in the Navy Program Objectives Memorandum by June 1, 1992. Therefore, a resource allocation decision will be completed and the affordability of the Program assessed prior to entry into Engineering and Manufacturing Development. It is important to note that the revised affordability assessment in the updated IPS presented at the May 6, 1992, DAB showed that the cost of the F/A-18 E/F Program caused the Navy to exceed projected funding levels.

Our more detailed response to management comments by ASN(RD&A) on the factual content of the draft report is in Part IV of this report.

STATUS OF RECOMMENDATION

<u>Number</u>	<u>Addressee</u>	<u>Response Should Cover:</u>			<u>Related Issues*</u>
		<u>Concur/ Nonconcur</u>	<u>Proposed Action</u>	<u>Completion Date</u>	
1.	USD(A)	X	X	X	IC

* IC equals material internal control weakness.

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PART III - ADDITIONAL INFORMATION

- Appendix A - F/A-18 E/F Acquisition Decision Memorandum
- Appendix B - Summary of Potential Benefits Resulting from Audit
- Appendix C - Activities Visited or Contacted
- Appendix D - Report Distribution

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ACQUISITION

THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301

12 MAY 1992

MEMORANDUM FOR SECRETARY OF THE NAVY

SUBJECT: F/A-18 E/F Acquisition Decision Memorandum

On May 6, 1992, the Defense Acquisition Board (DAB) conducted a Milestone IV review of the F/A-18 E/F program. The Joint Requirements Oversight Council validated the performance section of the Acquisition Program Baseline (APB) and noted a need to field the F/A-18 E/F new capability in range and recovery payload as soon as prudently possible. The Conventional Systems Committee recommended: entry of the F/A-18 E/F into Engineering and Manufacturing Development (EMD); release of the Request for Proposal (RFP); and approval of the Navy's acquisition strategy, the APB (as modified), and the proposed exit criteria.

I approve Milestone IV for F/A-18 E/F and authorize entry into EMD subject to submission of a fully funded F/A-18 E/F program on or before June 1, 1992, in the Navy Program Objectives Memorandum (as was agreed to by the Navy Acquisition Executive at the DAB). The F/A-18 E/F Acquisition Strategy Report is approved and the RFPs may be released. I intend to review the letter contracts for EMD of the airframe and engines before award. My approval decision for the letter contract award must be further supported by initial data in the comprehensive A-X COEA to be submitted by the Navy which also addresses the F/A-18 C/D and F/A-18 E/F alternatives. Undue delays in definitization are not desirable. The letter contracts submitted for my review should include limitations on cost reimbursement that are more stringent than normal if timely definitization does not occur. The Navy will submit for review the formal A-X COEA, at least 30 days before definitization of the letter contracts. I approve the exit criteria for the EMD phase at TAB A.

I will require a DAB Milestone IIIA prior to the approval of low rate initial production (LRIP), tentatively scheduled for 1Q FY97, for the following LRIP quantities:

- LRIP1 in FY97 - quantity of 12 aircraft and 34 engines
- LRIP2 in FY98 - quantity of 12 aircraft and 31 engines
- LRIP3 in FY99 - quantity of 18 aircraft and 46 engines

I have waived the requirements for live fire testing prescribed by 10 U.S.C. §2366, and submitted to Congress the requisite certification and report under that section. A COEA is not required in this case either by law or DoD Directive 5000.1/Instruction 5000.2. I have considered whether a COEA should nevertheless be prepared as a matter of policy in light of the

financial magnitude of this development effort, but concluded that a COEA need not be prepared. Sufficient information in the context of this decision is already available to me. The Navy shall submit the revised, signed APB incorporating the changes agreed upon in preparation for the DAB within one week of the date of this memorandum. The Navy shall also provide a plan to address missile approach warning within 90 days of the date of this memorandum.


Don Yockey

Attachment

TAB A

PROPOSED LONG LEAD FOR FIRST LRIP LOT EXIT CRITERIA (1st QTR FY96)

(VALIDATED BY ENGINE TEST AND ENGINE/AIRCRAFT DESIGN ANALYSIS)

(IPS PAGE 11)

SPECIFIC EXIT CRITERIA

EXIT CRITERIA AREA

- Release AAC funding for LRIP-1
 - Fighter escort radius
(2) AIM-9 + (2) AIM-120 + fuel ≥ 390 nm
 - Interdiction radius
 - (2) 480 gal fuel tanks + C₁ pylon + 4 Mk83 + 2 AIM-9 + FLIR/TINS ≥ 380 nm
 - (3) 480 gal fuel tanks + C₁ pylon + 4 Mk83 + 2 AIM-9 + FLIR/TINS ≥ 420 nm
 - P₀ : 0.9M/10,000ft/lb ≥ 600 fps
 - Recovery WOD
 - (0) AIM-9 + (2) 480 gal tanks + FLIR/TINS + fuel for CLDGW ≤ 19 kts
 - Approach speed
 - (0) AIM-9 + (2) 480 gal tanks + FLIR/TINS + fuel for CLDGW ≤ 154 kts
 - E-1 aircraft empty weight ≤ 31,950 lbs
 - Demonstrate parts flow, system availability, major assembly, and actual schedule support E&MD aircraft delivery schedules

PROPOSED MS III EXIT CRITERIA

(IPS PAGE 10)

EXIT CRITERIA AREA MSIII APPROVAL

SPECIFIC EXIT CRITERIA

- Delivery and acceptance of 12 LRIP-1 aircraft
- MFHIF 1.7 hrs (validated by analysis)
- MMHIF 15 hrs (validated by analysis)
- Demonstrate parts flow, system availability, major assembly and actual schedules support LRIP-II production schedule

THE FOLLOWING TO BE DEMONSTRATED IN TECHEVAL:

- Fighter escort radius ≥ 410 nm
- (2) AIM-9 + (2) AIM-120 + fuel
- Interdiction radius
- (2) 480 gal tanks + C₁ pylon + 4 Mk83 + 2 AIM-9 + FLIR/TIN + full gun ≥ 390 nm
- (3) 480 gal tanks + 4 Mk83 + 2 AIM-9 + FLIR/TINS + full gun ≥ 430 nm
- P₁ : 0.9M/10,000ft/1g ≥ 600 fps
- Recovery WOD ≤ 15 kts
- (0) AIM-9 + (2) 480gal tanks + FLIR/TINS + fuel to CLDGW
- Approach speed ≤ 150 kts
- (0) AIM-9 + (2) 480gal tanks + FLIR/TINS + fuel to CLDGW

PROPOSED NPR-IV EXIT CRITERIA (1st QTR FY99)

EXIT CRITERIA AREA

- AAC FUNDING FOR FRP and LRP-3 FULL FUNDING

SPECIFIC EXIT CRITERIA

- Complete first lifetime fatigue test
- Complete engine FPQ which includes ASMET simulating 2000 hr hot section life
- Demonstrate carrier suitability
 - launch WOD \leq 33 kts
 - Approach speed \leq 153 kts
 - Recovery WOD \leq 18 kts

PROPOSED MSHIA (LRIP LOT 1) EXIT CRITERIA (1st QTR FY97)

EXIT CRITERIA AREA

- AAC FUNDING FOR LRIP-2
and FULL FUNDING FOR LRIP-1

SPECIFIC EXIT CRITERIA

- Demonstration of first flight of E-1, E-2, F-1,
E-4 and E-5 test aircraft

PROPOSED NPR-III EXIT CRITERIA (1st QTR FY98)

EXIT CRITERIA AREA

- AAC FUNDING FOR LRIP-3
and FULL FUNDING FOR LRIP-2

SPECIFIC EXIT CRITERIA

- Deliver seven(7) flight test and three(3)
ground test aircraft
- Demonstrate first major assembly of center
and aft fuselage in LRIP-1 aircraft
- completion of engine LPQ which includes ASMET
simulation of 1000 hour hot section life

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APPENDIX B: SUMMARY OF POTENTIAL BENEFITS RESULTING FROM AUDIT

<u>Recommendation Reference</u>	<u>Description of Benefit</u>	<u>Type of Benefit</u>
1.	Economy and Efficiency. Prepare a formal COEA on the F/A-18 E/F and alternative programs before entering into an engineering and manufacturing develop- ment contract in accordance with DoD Instruction 5000.2, part 4, section E; and update supporting cost estimates and afford- ability assessments.	Undeterminable.

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APPENDIX C: ACTIVITIES VISITED OR CONTACTED

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition, Washington, DC
Assistant Secretary of Defense (Program Analysis and Evaluation),
Washington, DC
Comptroller of the Department of Defense, Washington, DC
Deputy Director, Tactical Warfare Programs, Office of the
Director, Defense Research and Engineering, Washington, DC

Department of the Navy

Assistant Secretary of the Navy (Research, Development and
Acquisition), Washington, DC
Assistant Secretary of the Navy (Financial Management),
Washington, DC
F/A-18 Program Office, Naval Air Systems Command, Arlington, VA

Defense Agencies

Defense Intelligence Agency, Washington, DC

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APPENDIX D: REPORT DISTRIBUTION

Office of the Secretary of Defense

Deputy Secretary of Defense
Under Secretary of Defense for Acquisition
Director, Defense Research and Engineering
Assistant Secretary of Defense (Production and Logistics)
Assistant Secretary of Defense (Program Analysis and Evaluation)
Assistant Secretary of Defense (Public Affairs)
Director of Defense Procurement
Comptroller of the Department of Defense
Director, Operational Test and Evaluation

Department of the Navy

Secretary of the Navy
Assistant Secretary of the Navy (Financial Management)
Assistant Secretary of the Navy (Research, Development and Acquisition)
Comptroller of the Navy
Auditor General, Naval Audit Service

Defense Agency

Director, Defense Intelligence Agency

Non-DoD Federal Organizations

Office of Management and Budget
U.S. General Accounting Office, NSIAD Technical Information Center

Congressional Committees:

Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
Ranking Minority Member, Senate Committee on Armed Services
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
Ranking Minority Member, House Committee on Appropriations
House Committee on Armed Services
House Committee on Government Operations
House Subcommittee on Legislation and National Security,
Committee on Government Operations

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PART IV - MANAGEMENT COMMENTS

Assistant Secretary of the Navy (Research, Development and
Acquisition) Comments
Audit Response to Assistant Secretary of the Navy (Research,
Development and Acquisition) Comments

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Assistant Secretary of the Navy Management Comments



THE ASSISTANT SECRETARY OF THE NAVY
(Research, Development and Acquisition)
WASHINGTON, D.C. 20350-1000

APR 17 1992

MEMORANDUM FOR THE DEPARTMENT OF DEFENSE ASSISTANT INSPECTOR
GENERAL FOR AUDITING

Subj: AIG(A) DRAFT AUDIT REPORT ON THE F/A-18 PROGRAM AS A PART
OF THE AUDIT OF THE EFFECTIVENESS OF THE DEFENSE
ACQUISITION BOARD REVIEW PROCESS -- FY 1992 (PROJECT NO.
1AE-0036.03)

Encl: (1) Department of the Navy (DON) comments

In response to your memorandum of 12 March 1992, we have
reviewed the subject report. Detailed comments on the finding
and recommendation are forwarded as enclosure (1).

The Navy does not concur with the recommendation.


Gerald A. Cann

DEPARTMENT OF THE NAVY RESPONSE

TO

AIG(A) DRAFT AUDIT REPORT NO. 1AE-0036.03

ON

THE REVIEW OF THE F/A-18E/F PROGRAM AS A PART OF THE AUDIT OF
THE EFFECTIVENESS OF THE DEFENSE ACQUISITION BOARD REVIEW PROCESS

1. Finding A - COST AND OPERATIONAL EFFECTIVENESS ANALYSIS

A. Summary of the Finding:

The Navy had not performed a COEA for the F/A-18 E/F and alternative programs in support of entry into Engineering and Manufacturing Development, as required by DOD regulations and congressional guidance. The Navy requested that the COEA requirement be waived because of the need to proceed promptly with the F/A-18E/F aircraft. The Navy concluded that the F/A-18 is the best alternative for enhancing fleet air capabilities until a follow-on program is fielded. Without a COEA, viable alternatives to this new development program, including the Navy AX program, may not be adequately assessed with regard to their relative cost and operational effectiveness before the F/A-18E/F Program is developed.

II. Navy Comments on the Finding

A. General Comments:

During the period from September 1990 to January 1991 a number of key decisions were made affecting naval aviation. The A-12 program was canceled; the NATF program was terminated as was the F-14 production and/or remanufacturing program. For affordability reasons the Navy plans to "neckdown" to the F/A-18E/F and the AX as the aircraft that will ultimately replace the F/A-18C/D, the A-6, and the F-14. The President's FY 1992/1993 budget, therefore, included funds for development of the F/A-18E/F.

The F/A-18E/F is a logical continuation of an upgrade strategy for the Navy's multi-role strike fighter that began in 1982. The F/A-18E/F will capitalize on ten years of investment in F/A-18 upgrades and maintain ninety percent of the F/A-18 C/D night attack avionics and software. Maintenance, training and support infrastructure already in place provides a solid basis for deployment and operation of the F/A-18E/F. As a result the Navy can avoid many of the development and recurring costs that would otherwise be associated with a new development. The upgrade

Assistant Secretary of the Navy Management Comments (Continued)

Final Report Reference

strategy allows the development to proceed on an incremental basis from a firm foundation. Since no technical leaps are required the overall risk is assessed as low to moderate. The aircraft can be developed, fully tested with very little concurrency, and be operational in time to offset declining inventories brought about by retirement of older aircraft. The growth capacity being designed into the F/A-18E/F will provide the Navy with a multi-role platform which can be upgraded in the future as threat and requirements dictate.

During preparation for the Defense Acquisition Board review, the Navy fully complied with DODI 5000.2, and OSD guidance. OSD agreed that the F/A-18 program would be reviewed at Milestone IV (Major Modification Approval) with plans to enter Phase II Engineering and Manufacturing Development.

In response to the COEA requirement Navy submitted engineering trade studies, effectiveness and cost analyses that were conducted from July 1987 to March 1992. These studies and analyses comply with the requirements of 5000.2, 5000.2M, and DOD guidance. The fact that F-14, NATF, and A-12 program decisions had already been made, narrowed the field of options to be considered to F/A-18 derivatives.

Because this audit was conducted in the middle of the DAB preparation process, the auditors reviewed draft documentation that did not reflect the complete review process, the incorporation of OSD recommendations, or the open exchange of ideas and comments between the Navy and OSD review officials. To accurately assess the effectiveness of the Defense Acquisition Board review process, which was the stated objective of this audit, the audit should consider the process from beginning to end. Reviewing only a partial process can result in incomplete, inaccurate, and misleading conclusions. For this reason the Navy recommends that this audit report not be published.

B. Specific comments:

1, para. 1
9, para. 5
10, para. 1

Page 1, paragraph 1; page 17, paragraphs 1 and 2. "The total cost of the aircraft is unknown because . . ." "The cost of developing and procuring . . . is not included . . .", and "The cost of preplanned product improvements have not been fully estimated."

The report faults the Navy for not having included in its estimate the cost of preplanned product improvements (P²I). However, while it is correct that the F/A-18E/F is being designed to allow for future growth should emergent requirements be defined, there are no unfulfilled requirements necessitating a P²I program at this time. The F/A-18E/F configuration as currently defined, and without P²I, fully meets the stated operational requirements. The Navy cost estimates reflect the complete cost to develop and procure the F/A-18E/F.

Final Report
Reference

6, para. 2

The allowance for growth is merely a prudent feature to include in an aircraft that will be in service beyond 2030. This will allow the Navy to take advantage of future technological improvements and/or to respond to future threats. The affordability of such improvements will have to be addressed as each one is defined/proposed.

Page 9, paragraph 2 - DODI 5000.2 requirements for COEA misquoted.

The draft audit report does not accurately reflect the contents of DOD instruction 5000.2 concerning the requirements for a COEA to support a milestone IV review. In fact, DOD instruction 5000.2 provides flexibility concerning whether or not a COEA is required for a Milestone IV review and if one is done, what form it should take. The following is quoted directly from page 4-E-7 of DOD instruction 5000.2:

"At Milestone IV, Major Modification Approval, the milestone decision authority may elect to require a cost and operational effectiveness analysis. The essential elements of this analysis will be specified by the milestone decision authority as part of the pre-milestone planning process." (emphasis added).

It was with this flexibility in mind that the Navy, in ASN (RD&A) memorandum of 30 August 1991, recommended that a COEA not be required. That memorandum also included Navy recommendations as to content of a COEA if one were required.

The Navy's rationale for recommending that a COEA not be required was that all viable alternatives had been eliminated by decisions that led up to the President's FY 1992/1993 budget. The NATF program had been terminated as had F-14D new production and/or remanufacture. For affordability reasons the Navy plans to "neckdown" to the F/A-18E/F and the AX as the aircraft that will ultimately replace the F/A-18C/D, the A-6, and the F-14.

Given that this was the case the Navy concluded that information presented to the DAB should focus on establishing the most cost effective configuration for the F/A-18E/F. OSD agreed with this approach as reflected in the major issues guidance memorandum of 27 September 1991. The Navy has provided to OSD the results of the configuration studies that have led to the current F/A-18E/F definition and has been fully responsive to the requests for additional information. The Navy has provided data in eight volumes and twenty-six briefings that represented studies, analysis, scale model testing and flight testing. A 6 March 1992 memorandum from Deputy ASD (PA&E) to the Chairman of the Conventional Systems Committee (CSC) concluded "that the trade studies constitute sufficient rationale to support definition of the F/A-18E/F for Milestone IV." No issues/concerns relating to this subject were cited in the subsequent CSC minutes of 8 April 1992.

Assistant Secretary of the Navy Management Comments (Continued)

Final Report Reference

- 6, para. 5 Page 11, paragraph 2 - Threat. The configuration selected is fully responsive to JROC validated requirements. The criticism in the DOD IG report appears to be that too much capability may have been designed into the F/A-18 E/F in the light of a clearly reduced threat, and that a proportionally smaller number of aircraft carriers might not require additional aircraft with improved capabilities.
- 7, para. 3 A careful review of both the Hornet 2000 Report (the Navy study published in 1988) and System Threat Assessment Report (NAVMIC TA #037-92 January 1992) would reveal that both documents address almost identical threats, and that none of the capabilities currently designed into the F/A-18E/F baseline are based on projected adversary developments that collapsed with the former Soviet Union.
- 10, para. 3 Page 13, paragraph 1. The program was purposely structured as an upgrade to the F/A-18 airframe to incorporate additional fuel for increased range, increased aircraft carrier recovery payload, increased weapon carriage flexibility, improved survivability and vulnerability. Avionics systems and software are about ninety percent common with the F/A-18 C/D night attack weapon system. Maintenance and support infrastructure, training, and concept of operations, are largely common with the 1066 F/A-18 aircraft delivered to US and foreign customers to date. The development cost is significantly less than a new start.
- 11, para. 1 Page 19, paragraphs 1 and 2 " . . . life-cycle cost presentation . . ." The audit was conducted during the review process on draft documentation. On 28 February 1992 the Navy provided to OSD cost documentation that fully meets DODI 5000.2 requirements.
- 11, para. 2 Page 20, paragraph 2 " . . . projected production rate." The audit was conducted during the review process on draft documentation. Navy has since provided to OSD cost documentation that fully meets DODI 5000.2 requirements and shows a peak production rate of seventy-two aircraft per year and a total procurement quantity of 1000 aircraft. The final documentation also presented an affordability analysis that compares the F/A-18E/F funding requirements to the overall Navy budget and long range modernization and investment plans.
- III. OASG (A) Recommendation on the Finding
1. OASG(A) recommended that the Under Secretary of Defense for Acquisition require a formal Cost and Operational Effectiveness Analysis on the F/A-18E/F and alternate programs before entering into an engineering and manufacturing development contract in accordance with Senate report No. 102-154 and DODI 5000.2 part 4 section E. Revise supporting cost estimates and affordability estimates to comply with DOD Manual 5000.2M, part 4.

Navy comments.

Do not concur. The approach taken to fulfill COEA requirements for the F/A-18E/F Milestone IV review is consistent with the requirements of DOD instruction 5000.2 for Milestone IV and the direction Navy received from OSD. The Navy provided to OSD the results of configuration trade studies and cost analysis that spans the period from July 1987 to March 1992. Navy responded fully to OSD requests for information and data and provided briefings as requested.

The Navy has provided to OSD all cost analysis required by DODI 5000.2. Final cost estimate documentation was submitted to OSD on 28 February 1992. Because the draft findings were published before the review process was complete, the draft audit report does not contain the fact that the Program Manager's estimate, the Navy Center for Cost Analysis Independent Cost Estimate, and the OSD Cost Analysis Improvement Group cost estimate are within one percent of each other, and that the cost documentation provided to OSD meets DOD requirements.

The audit was conducted using draft documentation, before the Navy had responded to all OSD requests for information, and before the acquisition review process had been completed. The final documentation submitted to OSD on 28 February 1992, provides the affordability assessment required by DOD instruction 5000.2.

AUDIT RESPONSE TO ASSISTANT SECRETARY OF THE NAVY (RESEARCH, DEVELOPMENT AND ACQUISITION) COMMENTS

In the following paragraphs, we are responding to management comments by ASN(RD&A) on the factual content of the report.

Navy comments on the finding

General comments. The Navy stated that during preparation for the DAB review, it fully complied with DoD Instruction 5000.2 and OSD guidance. Further, the Navy indicated that OSD agreed that the F/A-18 Program would be reviewed at the Milestone IV with plans to enter Phase II. This is not accurate. OSD stated that it would have a Milestone IV/II with Milestone II documentation for a Milestone IV review.

The Navy further stated that in response to COEA requirements, it submitted engineering trade studies and effectiveness and cost analyses. We do not agree that these documents represent a COEA. On May 4, 1992, ASN(RD&A) submitted a memorandum to USD(A) summarizing the F/A-18 E/F cost effectiveness studies as conducted by the Navy. An ASD(PA&E) memorandum, dated May 5, 1992, which was a cover sheet to the ASN(RD&A) memorandum, stated that the purpose of ASN(RD&A) summary was to provide "cost-effectiveness rationale for the F/A-18 E/F that is consistent with that normally provided by a formal COEA." However, the memorandum indicated that these studies did not represent a formal COEA. Further, these documents did not comply with the congressional requirement for a COEA.

On May 6, 1992, a DAB Milestone IV/II review was conducted for the F/A-18 E/F. We reviewed the final documentation for the Independent Cost Estimate, the Program Life-Cycle Cost Estimate, the IPS, and the Acquisition Program Baseline, which were documents included in the DAB review to determine if these documents contained or referenced a formal COEA. None of the documents indicated that a COEA was performed to determine the total life-cycle costs and operational effectiveness of the F/A-18 E/F or alternative programs.

Specific comments. Our response is structured to correspond with the main focus of the Navy's paragraphs.

Preplanned product improvement. The Navy stated that the report faults the Navy for not having included in its estimate the cost of preplanned product improvement. We believe that by not including an estimate of preplanned product improvement costs in the cost of the aircraft program, decisionmakers are not provided a valid estimate on which to base their decisions. As mentioned in our report, the Navy is planning aircraft upgrades shortly after the basic configuration is fielded, which could require significant additional funding. The need to include preplanned product improvement cost is even

more relevant. Since the completion of our audit fieldwork, the unit cost of the aircraft increased even without the addition of preplanned product improvements. On February 28, 1992, the Acquisition Program Baseline document decreased the number of aircraft to be procured from 1,456 to 1,000, thereby increasing the unit cost of the aircraft from \$44.3 million to \$49.1 million (FY 1990 dollars).

Cost and Operational Effectiveness Analysis requirements. The Navy stated that the report does not accurately reflect the contents of DoD Instruction 5000.2 concerning the requirements for a COEA to support a Milestone IV review. Our comments to this statement are included in the "Audit Response to Management Comments" section on page 14 of this report.

Threat. The Navy states that a review of both the Navy Trade Study and the STAR would reveal that both documents addressed almost identical threats and that none of the capabilities currently designed into the F/A-18 E/F baseline are based on threats prior to the collapse of the former Soviet Union. Our review of the threat sections of the Navy Trade Studies and the STAR showed that these sections address the threat prior to the collapse of the former Soviet Union. The DIA made approximately 165 substantive changes to the STAR because it did not reflect current events. The Trade Studies were not examined by the DIA; therefore, no assurance is offered that the Studies reflect operational requirements to meet the specified threat. The report makes no contention that too much capability is designed into the system, rather that the system requirements should reflect the expected threat through its useful life based on assessments by the proper body.

Program structure. The Navy stated that the Program was purposely structured as an upgrade to the F/A-18 airframe and that development cost was significantly less than a new start. Our report noted the upgrade to the airframe; however, the proper means to show that the F/A-18 E/F development costs are less than a new start would be to include estimated preplanned product improvement costs. Additionally, a COEA should be prepared to assess program alternatives coupled with an affordability assessment of development and production costs, inclusive of production rates.

Life-cycle cost presentation. The Navy stated that the audit was conducted during the review process on draft documentation concerning life-cycle costs. Subsequent to the draft report, we reviewed final documentation and found that the final IPS presentation on life-cycle cost is still misleading. The document excludes up to 25 years of additional O&S costs and provides a total life-cycle cost figure that does not include O&S costs in then-year dollars. The inclusion of total O&S costs in

the Navy's Independent Cost Estimate does not compensate for the faulty presentation or misinformed conclusions that could be reached by reviewing the IPS.

Projected production rate. The Navy again stated that the audit was conducted during the review process on draft documentation and subsequent documentation was provided to OSD. We reviewed the Acquisition Program Baseline, dated February 28, 1992, and the IPS, dated February 26, 1992, and made changes to the report updating the status of the program. Our report reflects that the procurement quantity reduction to 1,000 aircraft and a peak production of 72 aircraft per year could cost as much as \$3.5 billion per year, based on increased average unit cost of \$49.1 million per aircraft.

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